



# NOTES

## PERICARDIAL DISEASE

### GENERALLY, WHAT IS IT?

#### **PATHOLOGY & CAUSES**

- Disorders affecting pericardium
- Pericardial cavity:** space between visceral, parietal layer, normally filled with 15–50ml of plasma filtrate

#### **CAUSES**

- Infections:** mostly viral; bacterial, fungal rare
- Malignancy, mediastinal radiation
- Dressler's syndrome
- Trauma
- Drugs, toxins
- Metabolic disease (e.g. uremic syndrome, myxedema, ovarian hyperstimulation syndrome), connective tissue disease
- Immune-mediated disorders

#### **COMPLICATIONS**

- Heart failure, circulatory problems, problems breathing

#### **SIGNS & SYMPTOMS**

- See individual diseases

#### **DIAGNOSIS**

##### **DIAGNOSTIC IMAGING**

- Echocardiogram
- X-ray

##### **OTHER DIAGNOSTICS**

- ECG

#### **TREATMENT**

- Pericardiocentesis, pericardiectomy



#### **MNEMONIC: CARDIAC RIND**

##### **Causes of Pericarditis**

**C**ollagen vascular disease  
**A**ortic aneurysm  
**R**adiation  
**D**rugs  
**I**nfections  
**A**cute renal failure  
**C**ardiac infarction  
**R**heumatic fever  
**I**njury  
**N**eoplasms  
**D**ressler's syndrome

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## SYMPTOMS SIMILAR TO PERICARDITIS

|                           | CONSTRUCTIVE PERICARDITIS | CARDIAC TAMPONADE | LIVER CIRRHOSIS |
|---------------------------|---------------------------|-------------------|-----------------|
| PULSUS PARADOXUS          | Absent                    | Present           | Absent          |
| BRAIN NATRIURETIC PEPTIDE | ↑                         | ↓                 | ↑               |
| BLOOD PRESSURE            | Normal                    | ↓                 | ↑               |
| PERICARDIAL KNOCK         | Audible                   | Absent            | Absent          |
| ASCITES                   | Present                   | Absent            | Present         |
| JUGULAR VENOUS PRESSURE   | ↑                         | ↑                 | Normal          |
| KUSSMAUL'S SIGN           | Present                   | Absent            | Absent          |

## ACUTE PERICARDITIS

[osms.it/acute-pericarditis](https://osms.it/acute-pericarditis)

### PATHOLOGY & CAUSES

- Pericardial inflammation, myopericarditis
- Most common pericardial disorder

### CAUSES

- Idiopathic, viral (e.g. Coxsackie B), uremic syndrome (toxic to pericardium), Dressler's syndrome, autoimmune (e.g. rheumatoid arthritis, scleroderma, systemic lupus erythematosus), cancer, radiation, medications (e.g. penicillin, anticonvulsants)

### RISK FACTORS

- Surgery, cancer, autoimmune disease, connective tissue disorders, immunosuppression

### COMPLICATIONS

- Constrictive pericarditis, pericardial effusion, cardiac tamponade

### SIGNS & SYMPTOMS

- Fever, sharp chest pain worsened with deep breathing, symptoms improve with sitting up and leaning forward
- Pericardial friction rub heard on auscultation, like two pieces of leather rubbing together, loudest on left sternal border

## DIAGNOSIS

### DIAGNOSTIC IMAGING

#### X-ray

- “Water bottle sign,” liquid collects at the bottom if effusion present

#### Echocardiography

- Performed to exclude pericardial effusion

### OTHER INTERVENTIONS

- Clinical presentation suggestive of pericardial effusion

#### ECG

- ST elevation, PR depression, voltage changes, flattened, inverted T wave



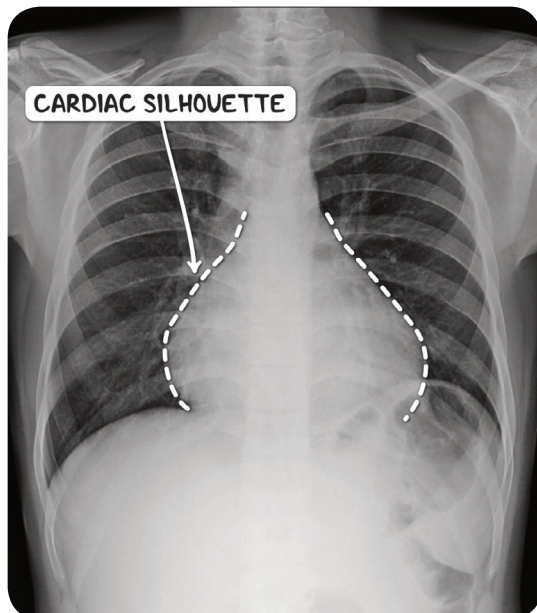
#### MNEMONIC: PSPPS

Acute pericarditis ECG

Pericarditi**S**

PR depression in **P**recordial leads

ST elevation



**Figure 14.1** A chest radiograph demonstrating the globular cardiac silhouette seen in a case of pericardial effusions secondary to acute pericarditis. This is also known as the water bottle sign.

## TREATMENT

- Targeted at etiology

### MEDICATIONS

- Treat pain, inflammation
  - Non-steroidal anti-inflammatory drug (NSAID) + colchicine
  - Glucocorticoids if NSAID contraindicated
  - Colchicine important if rheumatoid arthritis, Dressler syndrome involved

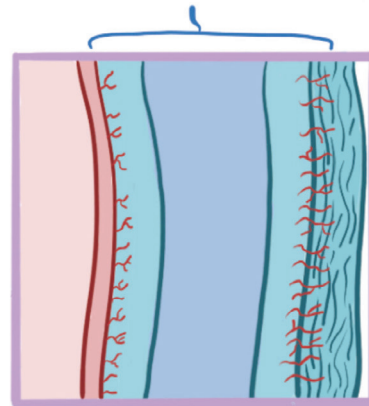
### SURGERY

- Pericardiotomy if high recurrence

### OTHER INTERVENTIONS

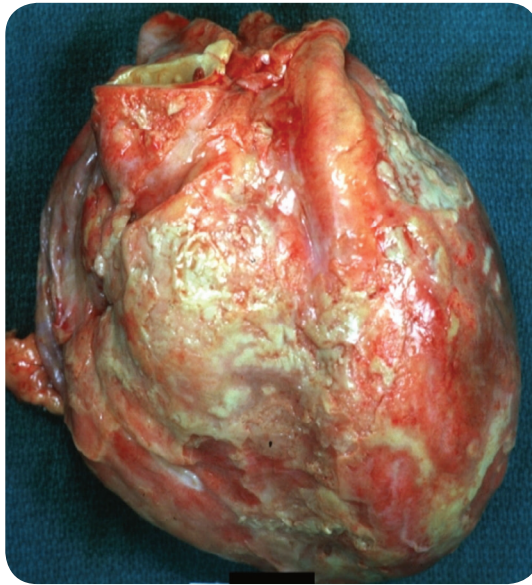
- Rest

FLUID & IMMUNE CELLS  
MOVE INTO  
PERICARDIAL TISSUES

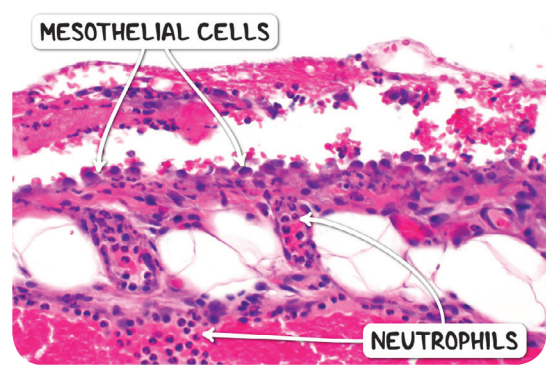


LAYER BECOMES  
THICKER

**Figure 14.2** Illustration depicting sclerosing of pericardial tissues in cross-section of heart wall.



**Figure 14.3** Gross pathology of acute fibrinous pericarditis. The yellow fibrinous exudate is clearly visible on the external surface of the heart.



**Figure 14.4** Histology photomicrograph demonstrating acute pericarditis. The mesothelial cells of the pericardium are surrounded by neutrophils and there is no fibrosis, indicating an acute inflammatory response.

## CARDIAC TAMPONADE

[osms.it/cardiac-tamponade](https://osms.it/cardiac-tamponade)

### PATHOLOGY & CAUSES

- Buildup of fluid in pericardium, constricts heart
- Tamponade = pressure obstructing flow
- Heart unable to pump normally → blood flow through chambers obstructed → cardiac output decreases → hypotension → lower tissue perfusion → heart rate increases

### CAUSES

- **Acute onset:** trauma, myocardial infarction, aortic dissection, pericardial effusion
- **Slow onset:** cancer, chronic inflammation, uremic pericarditis, hypothyroidism, connective tissue disease

### RISK FACTORS

- Individuals with malignancy, tuberculous, purulent pericarditis ≥ those with idiopathic pericarditis
- Individuals with fibrinolytic therapy, myocardial infarction

### SIGNS & SYMPTOMS

- Pulsus paradoxus due to ventricular interdependence
- Beck's triad (see mnemonic)
- **Tachycardia**, coughing, dyspnea, weakness, myocardial ischemia

**MNEMONIC: 3Ds****Beck's triad (Signs & Symptoms)**

- D**istant heart sounds
- D**istended jugular veins
- D**ecreased arterial pressure

## DIAGNOSIS

**DIAGNOSTIC IMAGING****Echocardiography**

- **Excess pericardial fluid**, heart "swinging" inside pericardial cavity

**SURGERY**

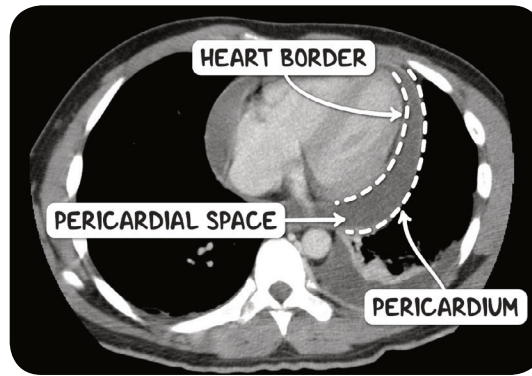
- Cardiac catheterization → pressure in all four chambers equal

**OTHER INTERVENTIONS**

- Clinical presentation

**ECG**

- **Tachycardia**, low QRS complex voltage, electrical alternans (QRS complexes have different heights)



**Figure 14.5** A CT scan in the axial plane demonstrating a large pericardial effusion, separating the pericardium from the heart itself and increasing the intrapericardial pressure, leading to cardiac tamponade.

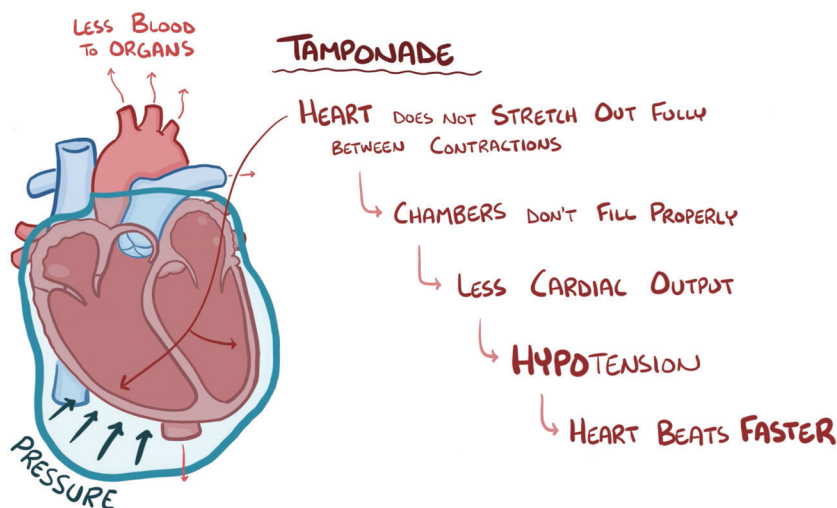
## TREATMENT

**MEDICATIONS**

- IV fluids

**OTHER INTERVENTIONS****Pericardiocentesis**

- **Needle inserted into pericardium** to drain excess fluid



**Figure 14.6** Illustration depicting fluid build up around pericardium, putting pressure on the heart walls and decreasing stroke volume.



# CONSTRICTIVE PERICARDITIS

osms.it/constrictive-pericarditis

## PATHOLOGY & CAUSES

- Formation of **thick, fibrotic pericardium** → compresses heart
- **Fibroblasts accumulate** between **pericardial layers** → collagen deposits → creates scars → layers become adherent, lose elasticity
- Heart filling difficult due to **stiffness of pericardium**
  - Ventricular interdependence: lowered heart wall compliance, decreased transpulmonary venous pressure → left ventricular filling decreases → lower volume in left heart → right bends septum towards left to increase volume
  - Maximal volume diminished, continues to decrease with disease progression
- **Volume overload**, hepatopathy, decreased cardiac output

## CAUSES

- **Idiopathic, viral, radiation**, myocardial infarction, collagen disorders, tuberculosis

## RISK FACTORS

- **Acute pericarditis**
- Cardiac surgery, radiation, connective tissue disorders, bacterial (purulent) infections

## COMPLICATIONS

- **Heart failure**, arrhythmias, cardiac tamponade

## SIGNS & SYMPTOMS

- Elevated jugular venous pressure (JVP)
- **Kussmaul's sign**: paradoxical inspiratory JVP
- **Pericardial knock**: heard before S3 on auscultation

- **Edema**: part of fluid overload; ascites, hepatosplenomegaly (HSM), cachexia (signs of hepatopathy); dyspnea (consequence of low cardiac output)
- Clinical manifestations of pleural effusion

## DIAGNOSIS

### DIAGNOSTIC IMAGING

#### X-ray

- Pericardial calcifications

#### Echocardiogram

- Stiff serous pericardium restricts heart's movement

#### CT scan

- Anatomical variations, thickness, distribution of scarring

### LAB RESULTS

#### Plasma brain natriuretic peptide (BNP)

- Differentiate between tamponade, cirrhosis, restrictive cardiomyopathy

### OTHER INTERVENTIONS

#### Invasive hemodynamic monitoring

- Increased pressure in right atrium, Kussmaul's sign

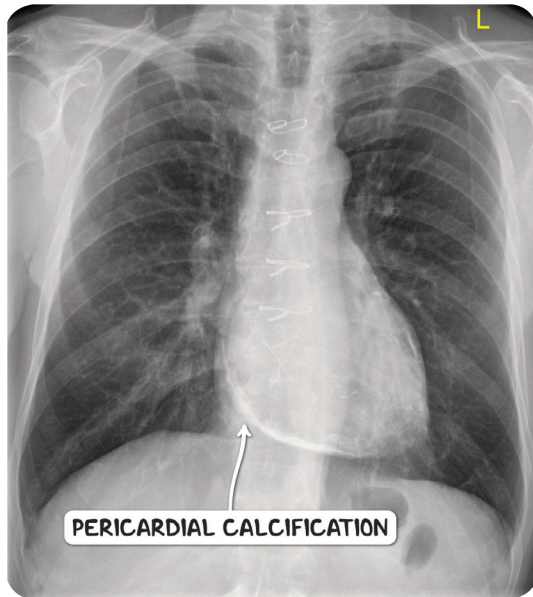
## TREATMENT

### MEDICATIONS

- Diuretics, NSAIDs, corticosteroids

### SURGERY

- Pericardiectomy (for progressive disease)



**Figure 14.7** A chest radiograph demonstrating pericardial calcification secondary to a chronic pericarditis.

## DRESSLER'S SYNDROME

[osms.it/dresslers-syndrome](https://osms.it/dresslers-syndrome)

### **PATHOLOGY & CAUSES**

- Secondary pericarditis, rare
- AKA postmyocardial infarction syndrome
- May or may not involve pericardial effusion
- $\geq$  two weeks after myocardial infarction (MI), **immune-mediated response** to injury  
→ antimyocardial antibodies respond to cardiac antigens → immune complex deposits in pericardium, pleura

### **SIGNS & SYMPTOMS**

- **Unusual fatigue after cardiac surgery/MI**
- Persistent fever, tachycardia, pulsus paradoxus
- **Manifestations of pericarditis:** friction rub, symptoms improve in sitting position
- **Pleural effusion signs:** pleuritic pain

### **DIAGNOSIS**

#### **DIAGNOSTIC IMAGING**

##### **Echocardiogram**

- Evaluate ventricular contractility; effusion, signs of tamponade

##### **Chest X-ray**

- Cardiac effusion

#### **LAB RESULTS**

- Complete blood count (CBC), CRP, erythrocyte sedimentation rate (ESR); troponin studies show leukocytosis,  $\uparrow$  CRP,  $\uparrow$  ESR; anti-heart antibody titer

#### **OTHER INTERVENTIONS**

##### **ECG**

- Changes same as acute pericarditis
- ST segment elevation, PR depression



## TREATMENT

### MEDICATIONS

- Colchicine recommended after cardiac surgery as preventative measure
- High dose aspirin, NSAIDs, corticosteroids

# PERICARDIAL EFFUSION

[osms.it/pericardial-effusion](https://osms.it/pericardial-effusion)

## PATHOLOGY & CAUSES

- **Abnormal accumulation of inflammatory fluid**, immune cells → diffuse into interstitium → fluid pools in pericardial space → pericardial dilation → pressure on heart, vena cava → decreased cardiac filling → cardiac tamponade → decreased cardiac output
- **Types of effusion**: serous, serosanguinous, chylous

### CAUSES

- Aortic dissection, heart failure, hypoalbuminemia, lymphatic obstruction, malignancy, radiation, renal failure, trauma, autoimmune disease, acute pericarditis (viral, bacterial, tuberculous, idiopathic in origin), myxedema, some drugs, iatrogenic, idiopathic

### COMPLICATIONS

- Cardiac tamponade
- Constrictive pericarditis

## SIGNS & SYMPTOMS

- Clinical presentation nonspecific, related to underlying cause, reflecting impaired cardiac function
- Diminished heart sounds
- Jugular vein distention
- Tachycardia, dyspnea, decreased blood pressure, lightheadedness

## DIAGNOSIS

### DIAGNOSTIC IMAGING

#### X-ray

- Silhouette pools to bottom of heart, gives classic “water bottle” sign

#### Echocardiogram

- Pericardial effusion makes heart look like it's dancing within pericardium, “swinging heart”

### LAB RESULTS

- **Elevated markers of inflammation**: C-reactive protein (CRP)

### OTHER INTERVENTIONS

#### ECG

- Low QRS complex voltage, electrical alternans, sinus tachycardia

## TREATMENT

### MEDICATIONS

- Relieve pain, treat underlying cause of inflammation

### SURGERY

- Pericardiocentesis